

1 **Amendment of the Claims**

2 Please amend Claim 22 as follows.

3 **In the Claims:**

4 1. (Original) A method for encoding a signal for storage or transmission, comprising the
5 steps of:

6 (a) implementing a two-dimensional transform of the signal, producing a
7 transform matrix having modulation frequency as one dimension;

8 (b) reducing a dynamic range of the signal;

9 (c) quantizing and selecting coefficients included in the transform matrix; and

10 (d) producing data packets in which the coefficients that have been selected are
11 encoded based upon a desired order of the coefficients, with coefficients that are more perceptually
12 relevant being used first to fill each data packet and coefficients that are less perceptually relevant
13 being handled in one of the following ways:

14 (i) discarded once an available space in each data packet that is to be
15 stored or transmitted has been filled with the coefficients that are more perceptually relevant; and

16 (ii) disposed last within each data packet, so that the coefficients that are
17 less perceptually relevant can subsequently be truncated from the data packet.

18 2. (Original) The method of Claim 1, wherein the step of implementing the two-dimensional
19 transform produces a phase matrix and a magnitude matrix, said magnitude matrix having the
20 modulation frequency as one of its dimensions and including a mean spectral density function of the
21 signal.

22 3. (Original) The method of Claim 2, further comprising the step of determining weighting
23 factors for use in reducing the dynamic range of the signal, based upon a perceptual model.

24 4. (Original) The method of Claim 3, wherein the step of determining the weighting factors
25 comprises the step of using the perceptual model to compute weighting factors from coefficients of
26 the mean spectral density function.

27 5. (Original) The method of Claim 3, further comprising the steps of converting the
28 weighting factors to a logarithmic scale; and thereafter, quantizing the weighting factors.

29 6. (Original) The method of Claim 5, further comprising the step of inverse quantizing the
30 weighting factors to produce inverse quantized weighting factors.

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1 7. (Original) The method of Claim 6, further comprising the steps of preparing the mean
2 spectral density function for quantization using the inverse quantized weighting factors; and
3 quantizing the means spectral density function thus prepared, producing a quantized mean spectral
4 density function.

5 8. (Original) The method of Claim 7, wherein the quantized mean spectral density function
6 is also encoded into the data packets.

7 9. (Original) The method of Claim 7, further comprising the step of producing an inverse
8 quantized mean spectral density function.

9 10. (Original) The method of Claim 9, further comprising the step of processing the inverse
10 quantized mean spectral density function with the perceptual model to produce bit allocations used
11 for encoding the data packets.

12 11. (Original) The method of Claim 10, further comprising the step of quantizing the phase
13 matrix and the magnitude matrix using a number of bits determined by the perceptual model.

14 12. (Original) The method of Claim 2, further comprising the step of quantizing the
15 magnitude matrix to produce a quantized magnitude matrix, wherein the step of producing the data
16 packets comprises the step of coding the quantized magnitude matrix with one of a fixed code and a
17 variable length code.

18 13. (Original) The method of Claim 1, wherein the step of producing the data packets includes
19 the step of ordering the data corresponding to the signal with respect to their perceptual relevance so that
20 data having lower modulation frequencies and lower base-transform frequencies are inserted into a data
21 packet before data having higher modulation frequencies and higher base-transform frequencies.

22 14. (Original) The method of Claim 1, wherein the step of implementing the
23 two-dimensional transform includes the steps of:

24 (a) transforming even numbered window sequences by a discrete cosine transform
25 to form an even transform sequence;

26 (b) transforming odd numbered window sequences by a discrete sine transform to
27 form an odd transform sequence; and

28 (c) forming an orthogonal complex pair by combining the even transform
29 sequence with the odd transform sequence.

30 15. (Original) The method of Claim 14, further comprising the step of applying a second
transform to the orthogonal complex pair.

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1 16. (Original) A method for encoding data packets with data derived from a perceptual signal,
2 said data packets being stored as originally encoded, or stored in a truncated form, or transmitted in a
3 truncated form over a network at a data rate that may be less than required to transmit non-truncated data
4 packets, comprising the steps of:

5 (a) applying a two-dimensional transform to the signal to produce a transform
6 matrix having modulation frequency as one dimension;

7 (b) quantizing a mean spectral density derived from the transform matrix, to
8 produce a quantized mean spectral density;

9 (c) determining an inverse quantized mean spectral density using the quantized
10 mean spectral density;

11 (d) deriving bit allocations from the inverse quantized mean spectral density using
12 a perceptual model;

13 (e) as a function of the bit allocations and the results of the two-dimensional
14 transform, producing quantized components; and

15 (f) determining an order in which the perceptual data are loaded into each data
16 packet, based upon the quantized components, wherein data that are perceptually more important are
17 loaded closer to a beginning of the data packet, while data that are perceptually less important are handled
18 in one of the following ways:

19 (i) loaded closer to an end of each data packet, if the entire data packet is
20 to be stored in a non-truncated form; and

21 (ii) eliminated from the data packets, if said data packets are to be stored or
22 transmitted over the network in the truncated form.

23 17. (Original) The method of Claim 16, wherein the step of applying the two-dimensional
24 transform produces a phase matrix and a magnitude matrix, said magnitude matrix having the
25 modulation frequency as one of its dimensions and including a mean spectral density function of the
26 signal.

27 18. (Original) The method of Claim 16, further comprising the step of processing the
28 perceptual signal with a perceptual model before applying the two-dimensional transform.

29 19. (Original) The method of Claim 16, further comprising the step of reducing a dynamic
30 range of the perceptual signal that is encoded into the data packets.

 20. (Original) The method of Claim 16, wherein the step of determining the order comprises
the step of ordering data for the perceptual signal so that lower modulation frequencies and lower
base-transform frequencies are inserted closer to the beginning of the data packets than higher
modulation frequencies and higher base-transform frequencies.

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1 21. (Original) A machine readable medium on which are stored a plurality of machine
2 readable instructions for carrying out the steps of Claim 16.

3 22. (Currently Amended) Apparatus for encoding data packets to include data derived from a
4 perceptual signal, said data packets being stored as originally encoded, or stored in a truncated form, or
5 transmitted in a truncated form over a network at a data rate that may be less than required to transmit
6 non-truncated data packets, comprising:

7 (a) a memory in which a plurality of machine instructions are stored;
8 (b) a source of a perceptual signal to be encoded into data packets;
9 (c) a processor coupled in communication with the source of the perceptual signal,
10 and the memory, said processor executing the machine instructions to carry out a plurality of
11 functions, including:

12 (i) applying a two-dimensional transform to the perceptual signal,
13 producing a transform matrix having modulation frequency as one dimension;

14 (ii) quantizing a mean spectral density of one component of the transform
15 matrix, to produce a quantized mean spectral density;

16 (iii) determining an inverse quantized mean spectral density using the
17 quantized mean spectral density;

18 (iv) deriving bit allocations from the inverse quantized mean spectral
19 density using a perceptual model;

20 (v) as a function of the bit allocations and the transform matrix, producing
21 quantized components; and

22 (vi) determining an order in which the perceptual data are loaded into each
23 data packet, based upon the quantized components, so that data that are perceptually more important
24 are loaded into a beginning of the data packet, while data that are perceptually less important are
25 handled in one of the following ways:

26 (1) loaded closer to an end of each data packet; and

27 (2) eliminated from the data packets.

28 23. (Original) The apparatus of Claim 22, wherein the two-dimensional transform produces a
29 phase matrix and a magnitude matrix, said magnitude matrix having the modulation frequency as one
30 of its dimensions and including a mean spectral density function of the perceptual signal.

 24. (Original) The apparatus of Claim 22, wherein the functions implemented by the
processor when executing the machine instructions further comprise processing the perceptual signal
with a perceptual model before applying the two-dimensional transform.

 25. (Original) The apparatus of Claim 22, wherein the functions implemented by the
processor when executing the machine instructions further comprise reducing a dynamic range of the
perceptual signal that is encoded into the data packets.

1 26. (Original) The apparatus of Claim 22, wherein the function of determining the order
2 arranges the data encoded into the data packet so that data having lower modulation frequencies and
3 lower base-transform frequencies are inserted closer to the beginning of the data packets than data
4 having higher modulation frequencies and higher base-transform frequencies.

5 27. (Original) The apparatus of Claim 23, further comprising a network interface that is
6 coupled to the processor and used to transmit the data packets over a network to a recipient device
7 that receives at least portions of each data packet transmitted over the network, said recipient device
8 including:

9 (a) a recipient memory in which a plurality of machine instructions are stored;
10 (b) a recipient network interface coupled to the network to receive encoded data
11 packets; and

12 (c) a recipient processor that is coupled to the recipient network interface and to
13 the recipient memory, said recipient processor executing the machine instructions stored in the
14 recipient memory to carry out a plurality of functions for decoding each encoded data packet,
15 including:

16 (i) decoding the mean spectral density and mean spectral density weights;
17 (ii) decoding template models from the encoded data packet;
18 (iii) decoding and reordering a magnitude content and a phase content from
19 the encoded data packet;

20 (iv) inverse quantizing the magnitude matrix and the phase matrix;
21 (v) adding the template models to the inverse quantized magnitude matrix,
22 said inverse quantized phase matrix and a result produced by thus adding comprising a
23 two-dimensional transform;

24 (vi) inverting the two-dimensional transform; and
25 (vii) performing post processing to yield a pulse code modulated signal
26 corresponding to the perceptual signal.

27 28. (Original) The apparatus of Claim 27, wherein the recipient processor, when executing
28 the machine instructions, also implements the following functions for each data packet that is
29 received:

30 (a) converts the mean spectral density and mean spectral density weights to a
decibel scale;

 (b) produces a signal-to-mask ratio for each of a plurality of frequency bins as a
function of the means spectral density and the mean spectral density weights; and

 (c) computes a number of bits to be used in each frequency bin for a remaining
magnitude matrix and a remaining phase matrix, such that a signal-to-noise ratio of the bits in the
plurality of frequency bins is greater than the signal-to-mask ratio.

1 29. (Original) A method for perceptually ordering data within data packets that are sized as a
2 function of either an available storage or an available data transmission bandwidth, comprising the
3 steps of:

4 (a) determining a mean spectral density function of the data for inclusion in the
5 data packets;

6 (b) determining a magnitude matrix and a phase matrix for the data;

7 (c) modeling the magnitude matrix;

8 (d) quantizing the magnitude matrix and the phase matrix for use in the data
9 packets; and

10 (e) perceptually ordering the data included in the data packets, so that perceptually
11 more important data are inserted first into each data packet, and perceptually less important data are
12 inserted successively thereafter to ensure that an available capacity of the data packets is filled with
13 perceptually more important data in preference to the perceptually less important data.

14 30. (Original) The method of Claim 29, further comprising the step of enabling a bit
15 resolution of the data packets that defines the capacity of the data packets to be selectively scaled as a
16 function of the data transmission bandwidth of a network over which the data packets are transmitted.

17 31. (Original) The method of Claim 29, further comprising the step of enabling a bit
18 resolution of the data packets that defines the capacity of the data packets to be selectively scaled as a
19 function of a capacity of the available storage in which the data packets are stored.

20 32. (Original) The method of Claim 29, further comprising the step of decoding the data
21 packets to recover the data to create a perceptible signal adapted to provide a perceptible experience
22 by a user, loss of the perceptually less important data from the data packets being perceptually less
23 noticeable in the perceptible signal as perceived by the user than would be a loss of perceptually more
24 important data.

25 33. (Original) The method of Claim 29, further comprising the step of storing data packets
26 from which the perceptually less important data have been excluded in a storage.

27 34. (Original) The method of Claim 29, further comprising the step of transmitting data
28 packets from which the perceptually less important data have been excluded, over a network.

29 35. (Original) The method of Claim 29, further comprising the step of truncating
30 perceptually less important data from the data packets as necessary to accommodate an available data
transmission rate for a network channel over which the data packets are to be transmitted.

 36. (Original) The method of Claim 35, wherein perceptually less important data are
truncated from the data packet to achieve a data packet size sufficiently small so that the data packets
are transmitted over the network channel in a continuous stream and so that the data conveyed by the
data packets are adapted to be perceptually experienced by a user in real time as the data packets are
received.